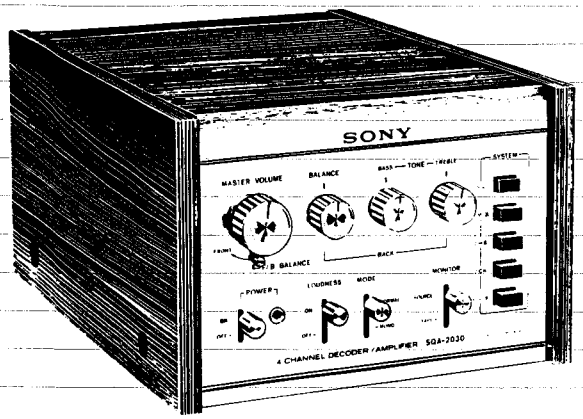
SONY



SQ DECODER/AMPLIFIER

SQA-2030

Owner's instruction manual

INTRODUCTION

Welcome to the superb new world of SQ four-channel sound, now yours via the Sony SQA-2030 SQ Decoder/Amplifier.

SQ Four-channel sound is a method of reproducing the original sound of an orchestra or live performance in the most realistic manner possible to date, by utilizing four separate sound pickups that encompass the source or sources of the sound. See the illustration below. These four sound signals are then combined into two, so that they can be recorded on a phonograph record or tape, or broadcast over an fm stereo station. This complex mixing process is called SQ encoding and was developed by CBS Laboratories, with the home consumer equipment subsequently being developed by Sony.

Before the recorded or transmitted program is heard by the listener, it undergoes the reverse process, called SQ decoding, which recreates the original four sound signals, that in turn feed four loudspeakers so located as to simulate the original recording sound field. These four sound channels permit a tremendous improvement over stereo in the accuracy of the reproduced sound, in that it is possible to duplicate the "ambience" of the concert hall or auditorium, and to very precisely establish the location of a sound, such as that of an instrument or vocalist.

Ambience is the blending of the original source sounds with their reflections from the floor, ceiling and walls of the concert hall or auditorium. It can only be duplicated later by surrounding oneself with sound, as is done in four-channel reproduction.

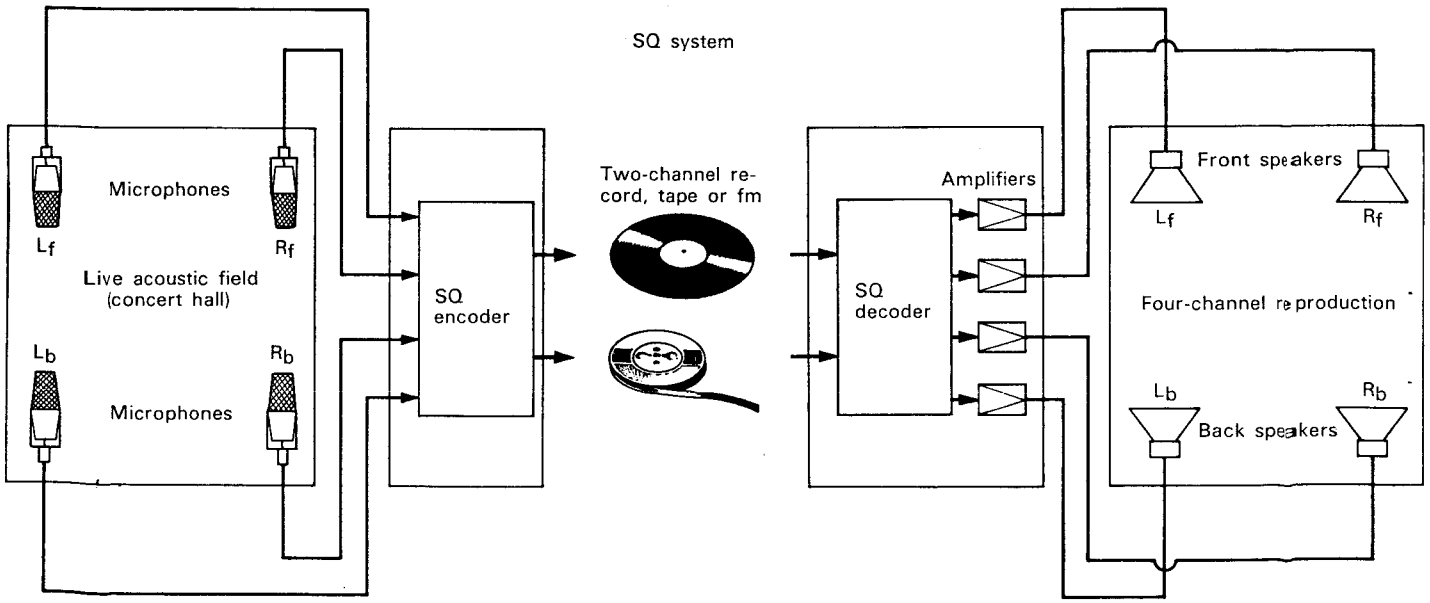
With four sound sources available, it is possible to place the apparent position of a sound anywhere in the area bounded by the loudspeakers, whether in front, behind, or to the sides of the listener, whereas in stereo one can only position a sound in a line between the two speakers.

These two innovations, the duplication of original scene ambience, and a precise spatial positioning make four-channel the great thing that it is—the means of reproducing sound with a clarity, detail and sense of presence that virtually duplicates the original.

FEATURES

- Full quadraphonic reproduction from SQ, other type matrix, and discrete four-channel programs merely by adding the SQA-2030 and two back speakers to your existing sound system.
- Full logic decoder with the advanced Sony SQ ICs : Front-back logic and waveform comparator logic circuits establish sufficient channel separation to "localize" the musicians where they belong. You will hear music indistinguishable from the original master tape and feel that you are actually in a concert hall.
- True compatibility with conventional two-channel stereo : The value of your existing stereo records and tapes will be enhanced because many two-channel recordings gain in "depth" when reproduced as a simulated four-channel sound. Two-channel reproduction is also available if desired.
- Clear and powerful amplifier for back channel: Employing hybrid ICs, the SQA-2030 assures sufficient power for the most difficult musical passage. Suitable amounts of negative feedback are applied to maintain flat response and low distortion.
- Convenience provisions are ; master volume control, front/back balance control and loudness switch on all four channels and back balance and tone controls for the back channels.

The connection and operation of the SQA-2030 will offer no difficulties if you read carefully through this manual and make each step as directed. Keep this manual for future reference.



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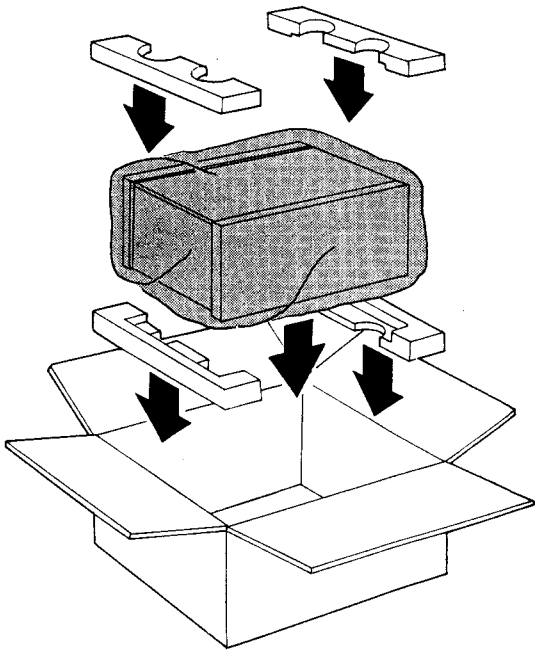
PREPARING FOR USE

UNPACKING

All Sony equipment comes to you carefully packed in cartons designed to withstand the rigors of shipment. Do not throw away the carton or associated packing material; they will come in handy if you ever have to transport or ship the SQA-2030.

Inspect your SQA-2030 immediately for signs of damage incurred in transit. If damage has occurred, consult your local Sony dealer for further instructions. Once again, save all packing material to help substantiate your damage claim.

When shipping the unit for repair work or to another location, the unit should be repacked in the original carton and packing material just as before.



DO AND DON'T

Before going ahead with the installation, make sure that your choice of location agrees with the following list of DOs and DON'Ts.

DO allow sufficient room behind the SQA-2030 so you can make connections to the rear panel without disrupting your entire setup.

DO turn off the power while making connections.

DON'T open the cabinet. There are no user serviceable parts inside. Refer servicing to qualified service personnel.

DON'T place the SQA-2030 in direct sunlight, or near radiators, hot-air ducts, or any heat source, or place it in any area subject to freezing temperatures or excessive moisture.

DON'T place anything on top of the cabinet which might block the top ventilation holes. Don't place the unit on any soft surface which may block the bottom ventilation holes.

DON'T connect the SQA-2030 to other than the proper power source (120 V ac, 60 Hz).

SYSTEM CONNECTIONS

The owner of a good quality two-channel system* can convert to a four-channel system by adding the Sony SQA-2030 and two more loudspeakers.
* Stereo system must have a tape/source monitor selector.

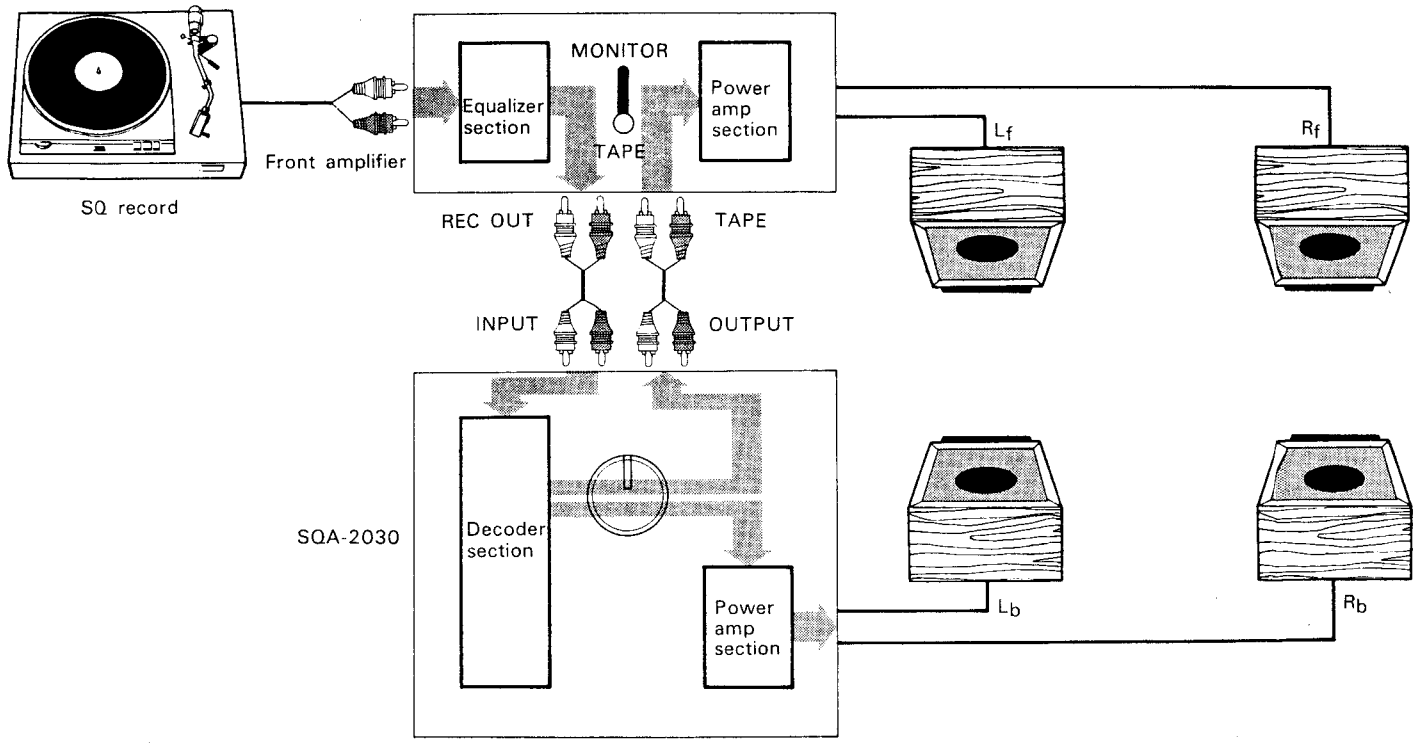
Use the existing connections between phono, fm/a-m tuner or auxiliary sources and the front amplifier. If a two-channel tape recorder is part of the system, it must be reconnected directly to the SQA-2030.

For the best four-channel reproduction, use speakers with the identical characteristics for the front and back channels. However, even if the front and back speakers are different, you can get good results by adjusting the channel levels as directed on page 8.

Signal Diagram of SQ System

The following diagram shows how the SQ setup works.

- SQ record signals go to the front amplifier equalizer and are fed to the SQA-2030 through the connection between the front amplifier recording outputs and the SQA-2030 FRONT PREAMP INPUTs.
- In the SQA-2030 the SQ signals are decoded to four channels.
- After passing through the MASTER VOLUME control, the front signals return to the front amplifier through the connection between the SQA-2030 FRONT PREAMP OUTPUTs and the front amlifier tape inputs. Note that since the front-channel signals return through the tape inputs, the front amplifier monitor switch should be set to the "tape" position to reproduce the returned signals.
- The front signals then go to the front speakers, as in an ordinary two-channel system, by passing through the mode switch, stereo balance control, tone controls and power amplifier section. The back signals go to the SQA-2030 tone and power amplifier section and are reproduced on the back speakers.



Connection Notes

To assure correct matching at the input and output terminals of your audio system, refer to the "SPECIFICATIONS" of the SQA-2030 on page 13, and to the specifications given in the instruction manuals provided with the components you want to connect to the SQA-2030. Generally the output level of a signal source (recording outputs of a front amplifier) should range from slightly higher to several times higher than the sensitivity of the SQA-2030 inputs. Also, the output impedance of a signal source should be considerably lower (several times or more) than the impedance of the corresponding input.

Refer to the overall-system connection diagram on page 6 while making connections.

For input and output connections use a low-capacitance shielded cable, otherwise, hum may occur. Keep the cables as short as possible since excessively-long horizontal runs (over 6 feet) may reduce the high-frequency response.

Use a red plug for the right-channel connection and the remaining plug for the left-channel connection.

Insert the cable connectors fully into the jacks since loose connections may cause hum and noise.

If reconnection is required, turn the MASTER VOLUME control fully counterclockwise to prevent possible speaker damage.

Speaker Location

In many home-entertainment stereo systems, the choice of speaker location is often limited by the existing furniture arrangement. However, if rearrangement is possible, or if you want to furnish the area specifically for stereo listening, here are a few suggestions for optimizing your listening pleasure.

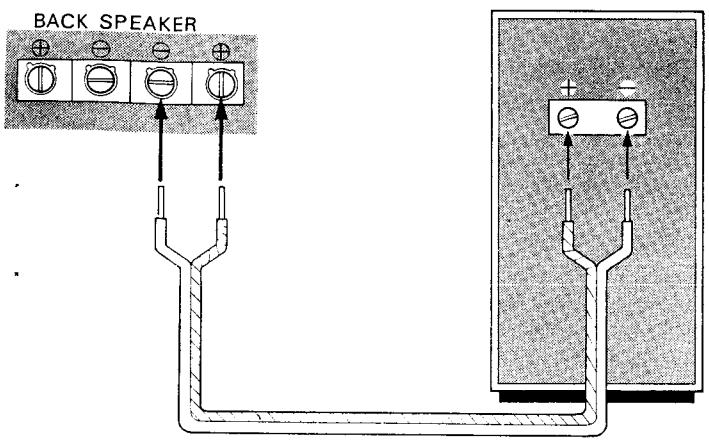
Set up your speakers in a large room having carpeting on the floor. If the room has heavy draperies, so much the better. Carpets, draperies, and upholstered furniture minimize the multiple reflections of high-frequency sound that occur in a bare room and which reduce the stereo effect.

Four-channel speaker placement is not especially critical. But for optimum acoustical effect we recommend you place the four speakers in a square or rectangular area having a maximum short-side to long-side ratio of approximately 1 : 1.5. When arranging the speakers in a rectangle, use the short-side for right and left channels, and the long-side for front and back channels.

Position the left and right speakers in similar acoustic environments. If you set up the left and right speakers in an unbalanced acoustic condition, i.e. positioning the left speaker in a corner and the right speaker in the middle of a wall, you will produce unbalanced bass—the left channel sound will be emphasized in this case since corner locations emphasize the bass tones.

If you must position the speakers off the floor, do not place them higher than eye-level. Because of psychological conditioning, sound coming from the vicinity of the ceiling gives an unnatural feeling.

Connections : Carefully connect the four speakers to the respective SPEAKER terminals of the front amplifier and the SQA-2030 ; left front speaker to left front terminals etc. and ⊕ to ⊕, ⊖ to ⊖. For simplifying the ⊕ and ⊖ terminal connections (speaker phasing), speaker cord has different colored leads. Connect a speaker ⊕ terminal and an amplifier ⊕ terminal with one color lead, and connect the ⊖ terminals with the remaining lead. When you use ordinary dual-conductor lamp cord, look for the colored thread molded in with one lead.



CAUTION

- Do not connect the speaker terminals of one channel together with those of the other channel.
- The SQA-2030 delivers 32 watts (per channel) of dynamic power into each 8-ohm speaker. Be sure to use speakers with suitable power handling capabilities. If low wattage speakers are to be used, reduce the volume when removing the phonograph pickup from a record or when tuning across the fm band. Speaker damage may result if this precaution is not observed.

Front Amplifier

Connect the recording outputs of the front amplifier to the SQA-2030 FRONT PREAMP INPUT jacks. Connect the tape inputs of the front amplifier to the FRONT PREAMP OUTPUT jacks. The input level can be changed in three steps with the associated LEVEL ADJUST (INPUT) switch (refer to page 8).

Record Player, Tuner and Auxiliary Sound Sources

Connect these sources to the front amplifier as usual. SQ records, conventional two-channel records, off-the-air programs and auxiliary sources are played through these connections.

Two-channel Tape Recorder

For tape playback, connect the line outputs of the tape recorder to the SQA-2030 2 CH TAPE RECORDER TAPE inputs. For tape recording, connect the line inputs of the tape recorder to the 2 CH TAPE RECORDER REC OUT jacks. The tape input level can be changed by the associated LEVEL ADJUST (TAPE) switch (refer to page 10).

If your tape recorder has the same type DIN 5-pin connector as that on the SQA-2030 (indicated REC/PB), the record and playback connections are made with a single 5-pin cable, such as the Sony Connecting Cord RC-2 (optional). When using this DIN connector, do not use the 2 CH TAPE RECORDER TAPE inputs and REC OUTputs.

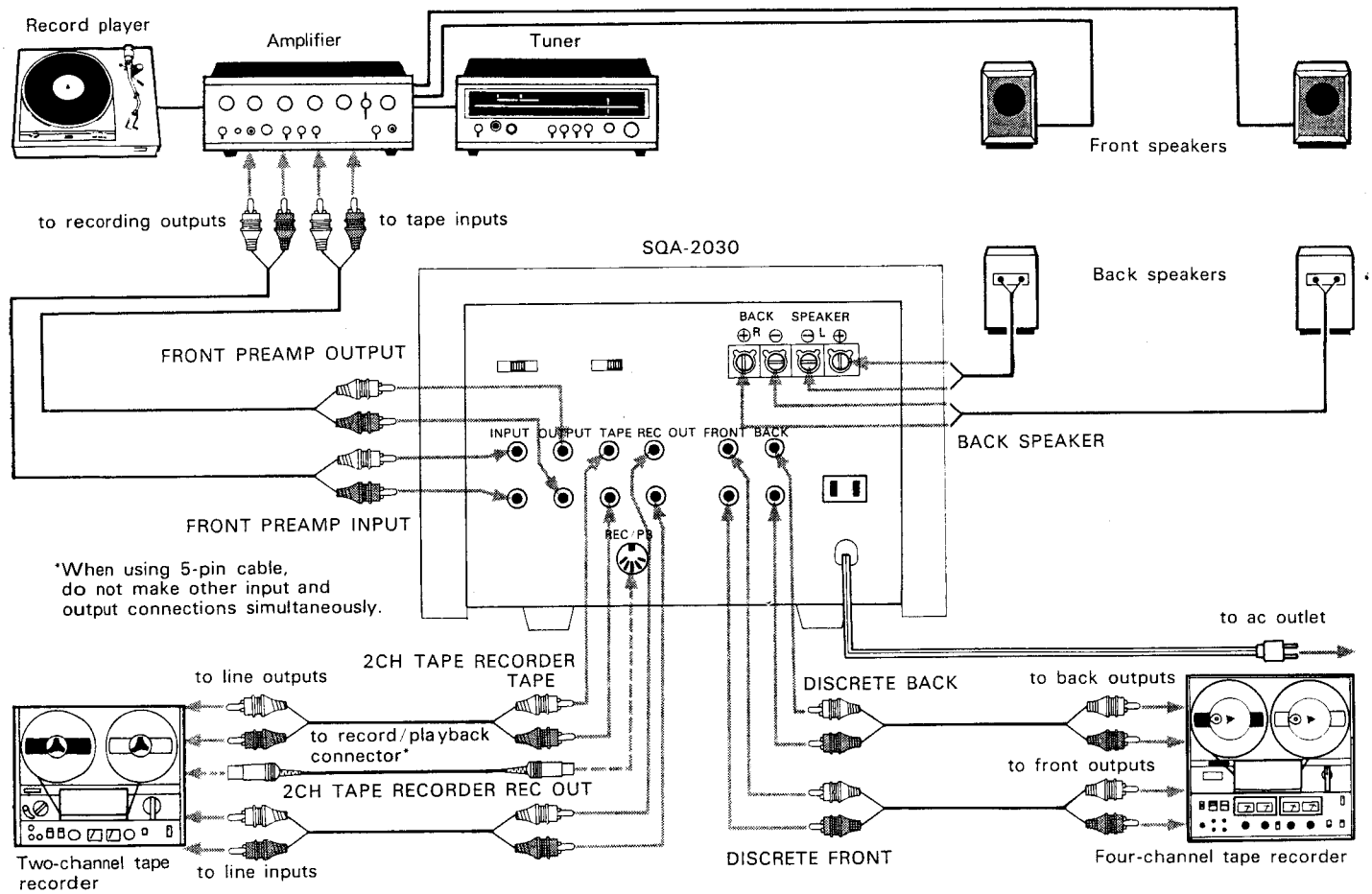
Discrete Four-channel Tape Recorder

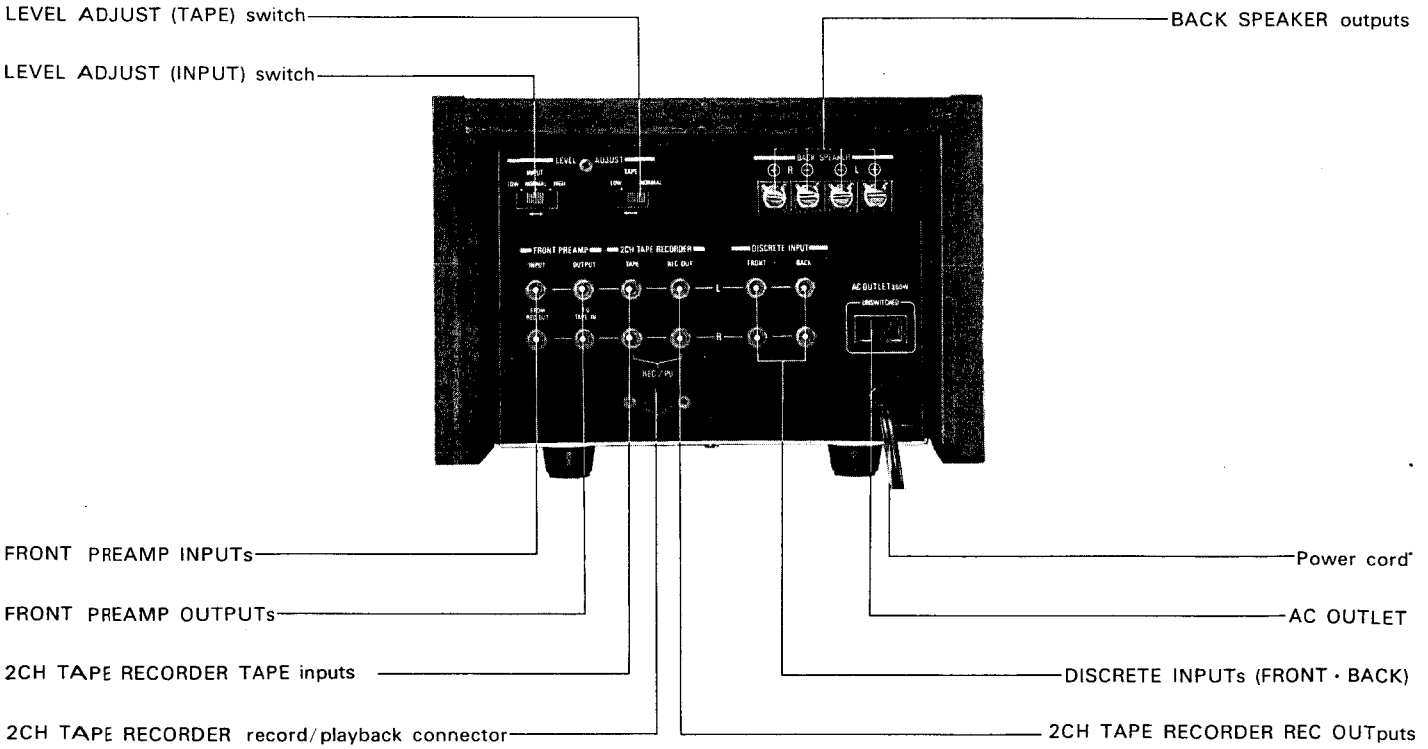
Connect the front line outputs of the tape recorder to the SQA-2030 DISCRETE FRONT INPUTs, and the back line outputs of the recorder to the DISCRETE BACK INPUTs. Check the connections of the left and right channels—left outputs to left inputs, and right outputs to right inputs.

Power Connections

Before making any form of power connection, make sure the POWER switch is set to OFF. Then plug the SQA-2030 line cord into a convenient 120V ac 60 Hz electrical outlet.

The UNSWITCHED AC OUTLET on the rear panel provides a convenient source of ac power (300 watts maximum) for any other system components. Equipment plugged into this outlet must have its own power switch.

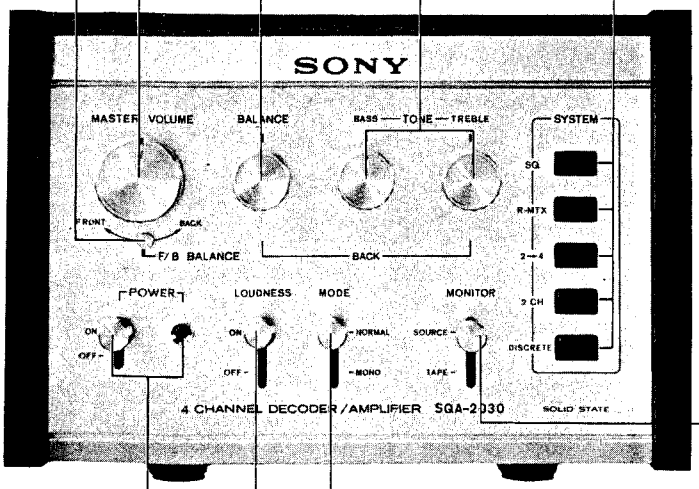

Record player
Amplifier
Tuner
Front speakers
to recording outputs
to tape inputs
SQA-2030
Back speakers
BACK SPEAKER
FRONT PREAMP OUTPUT
INPUT OUTPUT TAPE REC OUT FRONT BACK
BACK SPEAKER
FRONT PREAMP INPUT
REC/PB
*When using 5-pin cable, do not make other input and output connections simultaneously.
to ac outlet
2CH TAPE RECORDER TAPE
to line outputs
DISCRETE BACK
to back outputs
to record/playback connector*
to front outputs
2CH TAPE RECORDER REC OUT
Two-channel tape recorder
to line inputs
DISCRETE FRONT
Four-channel tape recorder


LEVEL ADJUST (TAPE) switch
LEVEL ADJUST (INPUT) switch
BACK SPEAKER outputs
FRONT PREAMP INPUTs
Power cord
FRONT PREAMP OUTPUTs
AC OUTLET
2CH TAPE RECORDER TAPE inputs
DISCRETE INPUTs (FRONT · BACK)
2CH TAPE RECORDER record/playback connector
2CH TAPE RECORDER REC OUTputs

OPERATING INSTRUCTIONS

Before attempting to operate your SQA-2030, take a few minutes to learn the location and function of the controls mentioned in the operating instructions.

FUNCTION AND LOCATION OF PARTS AND CONTROLS



F/B BALANCE control
Controls the volume balance between front and back channels. The center position setting is not always exact ; adjust the lever to your preference.

MASTER VOLUME control
Regulates the overall sound level of the four-channel system. Before using this control, set up each left-front, right-front, left-back and right-back channel level as directed under "Four-channel Balance Adjustments" on next page.

BALANCE control
Controls the stereo balance of the back channels.

BACK TONE controls (BASS and TREBLE)
Control the prominence of back channel bass and treble notes. Turn these controls clockwise to increase bass (or treble) response, counterclockwise to decrease response. Adjust to your preference.

SYSTEM selectors
These select the desired sound reproducing system ;
SQ . . . . . for SQ listening when playing SQ programs or conventional stereo programs*.
R-MTX . . . . . for matrix four-channel listening when playing other-type matrix programs.
2 → 4 . . . . . for obtaining ambience effects with conventional two-channel programs. With some records, this adds depth and presence.
2 CH . . . . . for two-channel listening when playing conventional stereo programs.
DISCRETE . . . for listening to discrete four-channel programs connected to the DISCRETE INPUTs.
* For conventional stereo programs, use either the SQ, R-MTX, or 2→4 position for four-channel listening, according to your preference.

MONITOR switch
SOURCE . . . . for listening to fm/a-m, phono, or auxiliary programs connected to the front amplifier.
TAPE . . . . . for listening to two-channel tape connected to the 2 CH TAPE RECORDER TAPE (REC/PB) inputs.
A discrete four-channel program can be played back only by depressing the DISCRETE button.

MODE switch
This switch is usually kept in NORMAL. The MONO position is used for four-channel level adjustment ; in this position the OUTPUT (to front preamp) and the BACK SPEAKER outputs provide a mono signal.

LOUDNESS switch
Set to ON when listening at very low levels, i.e. listening very late at night or reproducing background music while reading. The sound will be heard with an apparently flat output from the bass to the high range. This switch affects both the front and back channels, therefore turn off any front amplifier loudness control.

POWER switch and pilot lamp

FOUR-CHANNEL SOUND ADJUSTMENTS

After connecting as described in the previous section, make the following adjustments in the order given.

Preparation

1. Set the SQA-2030 controls as follows :

Control	Setting
MASTER VOLUME control	Fully counterclockwise*
F/B BALANCE control	Center*
BACK BALANCE control	Center*
SYSTEM button	Depress "2 CH."
MODE switch	MONO
MONITOR switch	SOURCE
BACK BASS control	Center
BACK TREBLE control	Center
LOUDNESS switch	OFF
LEVEL ADJUST (INPUT) switch (rear panel)	NORMAL*

2. Set the front amplifier controls as follows :

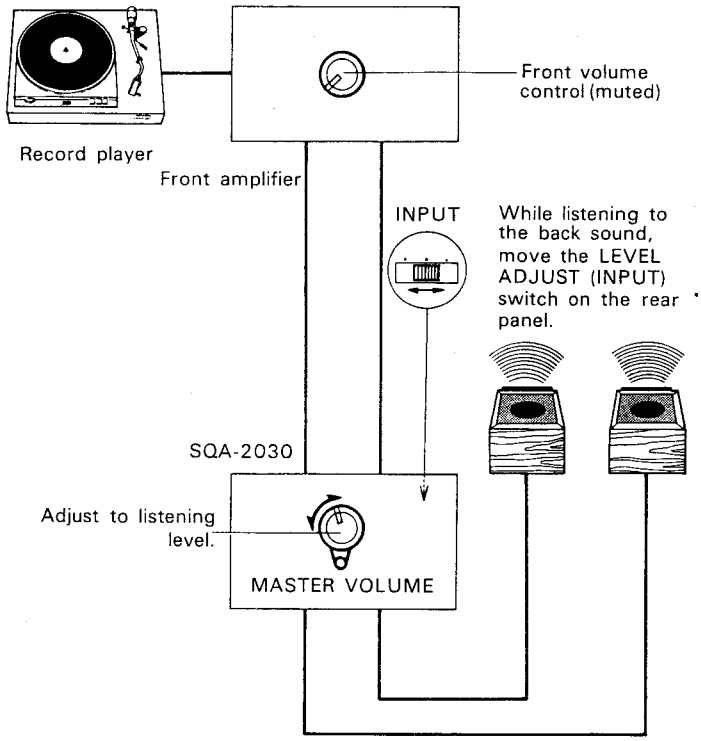
Control	Setting
Volume control	Fully counterclockwise*
Balance control	Previously usual position*
Mode switch	Stereo
Monitor switch	Tape
Input selector	Phono
Tone controls	Flat response settings
Loudness switch	Off

* Temporary settings

3. For input level setting and four-channel balance adjustment select a conventional stereo record containing the loudest sound in your record library, and for the phasing check select a record containing prominent bass notes.

SQA-2030 Input Level Setting

1. Turn on the SQA-2030 and the front amplifier.
2. Play the test record containing the loudest sound.
3. Adjust the SQA-2030 MASTER VOLUME control so that the back speakers provide your ordinary listening level.
4. If the sound is distorted (or the sound image is unstable) even with a low volume setting, move the SQA-2030 LEVEL ADJUST (INPUT) switch (on the rear panel) to HIGH to prevent decoder-input overload. If the sound is very low with the MASTER VOLUME control set at about 12 o'clock position, move the LEVEL ADJUST (INPUT) switch to LOW. Except for the above case, leave the switch at NORMAL.
5. If you move the LEVEL ADJUST (INPUT) switch to HIGH or LOW, readjust the MASTER VOLUME control to provide ordinary listening level.

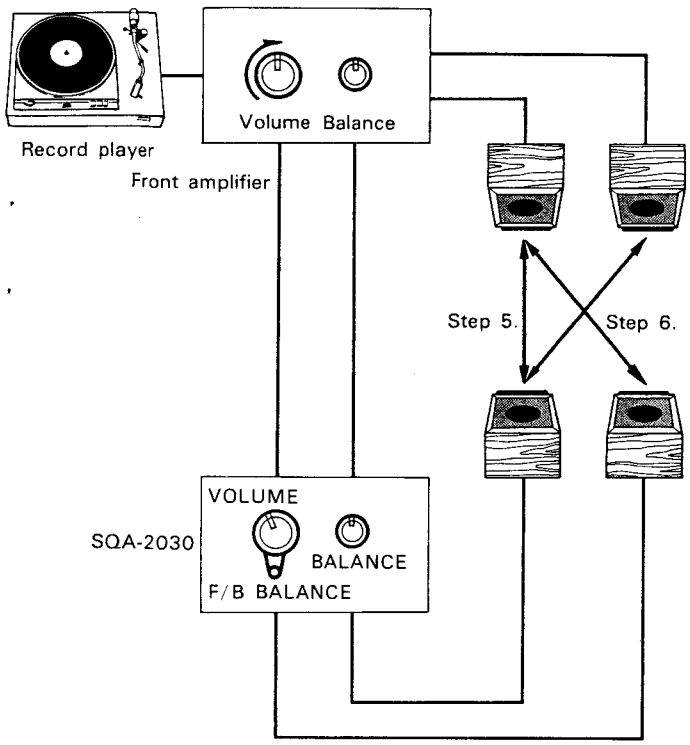

Front volume control (muted)
Record player
Front amplifier
INPUT
While listening to the back sound, move the LEVEL ADJUST (INPUT) switch on the rear panel.
SQA-2030
Adjust to listening level.
MASTER VOLUME

Four-channel Balance Adjustments

1. Turn on the SQA-2030 and the front amplifier.
2. Play the record used in the previous section ("Input Level Setting").
3. Ensure that the back speakers provide the usual level. If not, readjust the MASTER VOLUME control.
4. Mute either the right or left speakers of both front and back channels by moving the BALANCE controls of the SQA-2030 and the front amplifier.
5. Front volume setting : Turn the front amplifier volume control so that the front speaker provides the same level as that of the back speaker. Ensure that the front amplifier volume setting does not exceed the usual setting position. If it does, move the front amplifier volume control to the usual position and balance the front-back level with the SQA-2030 F/B BALANCE control*1.
6. Four-channel balance adjustments : Adjust the front amplifier balance control, the SQA-2030 BACK BALANCE control and the F/B BALANCE control so that the sound seems to come from a point central to the four speakers*2.
7. Mark or note the final setting positions of the front amplifier volume control and balance control, and the SQA-2030 F/B BALANCE and BACK BALANCE controls. Then, should someone inadvertently move these controls from their preset positions, or you move them during the phasing check in the next section, you can quickly restore the original settings.
8. After setting the four-channel balance properly, you can control the overall sound with the MASTER VOLUME control.

*1 : Do not set the front amplifier volume control too high. Otherwise speaker damage may result should you inadvertently set the front amplifier monitor switch to the source position.

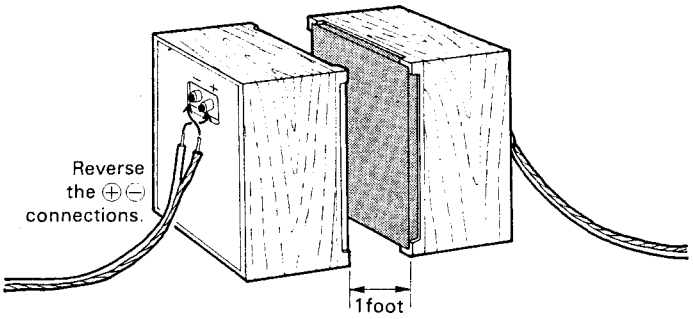
*2 : If you wish to separately balance the front and back channels, either the front or back speakers can be muted with the SQA-2030 F/B BALANCE control.

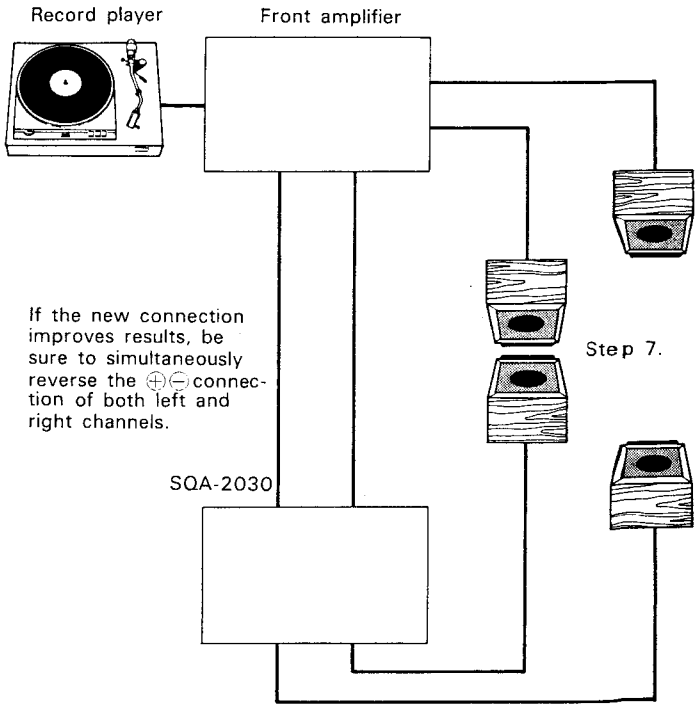


Phasing Checks

If the sound seems to lack bass notes and the position of the instruments is obscure, the speakers, front amplifier and the SQA-2030 may be phased improperly. Check the phasing as follows.
If you have already checked the front speaker phasing on your existing system, you may skip Step 5.

1. Turn on the SQA-2030 and the front amplifier.
2. Make the previously described adjustments, if you have not yet done so.
3. Play the test record containing prominent bass notes.
4. Turn the MASTER VOLUME control to a comfortable level.
5. Front-speaker phasing check :
   - 5-1. Set the F/B BALANCE control to FRONT to mute the back speakers.
   - 5-2. Place the front speakers so that they face each other about a foot apart.
   - 5-3. Listen to a recorded passage containing prominent bass notes.
   - 5-4. Reverse the connection of one of the speakers and listen to the same bass passage again. If the bass appears to have increased, the speakers were originally phased incorrectly and the new connection should be used. However, if it sounds like there is less bass, the speakers were correctly phased and the original connection should be restored.
6. Back-speaker phasing check :
   - 6-1. Set the F/B BALANCE control to BACK to mute the front speakers.
   - 6-2. Place the back speakers so that they face each other about a foot apart.
   - 6-3. Check the phasing as in Steps 5-3 and -4.
7. Front-back channel phasing check :
   - 7-1. Restore the F/B BALANCE control to the original setting as marked or noted at Step 7 in "Four-channel Balance Adjustments".
   - 7-2. Mute either the right or left channel speakers of both front and back with the balance controls of the front amplifier and the SQA-2030.
   - 7-3. Place the front and back speakers of the active channel just as in Step 5-2.
   - 7-4. Check the phasing just as in Steps 5-3 and -4. If you reverse a speaker connection, be sure to simultaneously reverse the ⊕ ⊖ connection of the mating speaker.




Record player
Front amplifier
If the new connection improves results, be sure to simultaneously reverse the ⊕⊖ connection of both left and right channels.
Step 7.
SQA-2030

This completes the adjustments

- Return the speakers to their previous location.
- Return the BALANCE controls of the SQA-2030 and the front amplifier to their original settings as marked or noted at Step 6 of "Four-channel Balance Adjustments".
- Set the SQA-2030 MODE switch to NORMAL. At NORMAL, the speaker volume will be higher than at MONO.

USING THE SQA-2030

After you have connected all of the components in your system and adjusted the levels and phasing, your SQ system is ready for operation.

Sound Reproduction

1. Check the SQA-2030 control settings as follows:

MODE switch	NORMAL
BACK BALANCE control	Final setting as marked or noted in Step 6 of "Four-channel Balance Adjustments" on page 8.
F/B BALANCE control	
MASTER VOLUME control	Fully counterclockwise

2. Check the front amplifier control settings as follows:

Monitor switch	Tape
Mode switch	Stereo
Volume control	Final setting as marked or noted in Step 6 of "Four-channel Balance Adjustments" on page 8.
Balance control	
Loudness switch	Off

3. Turn on the SQA-2030 and the front amplifier.
4. Select your desired program source as follows:
   - For a record, tuner, or auxiliary source connected to the front amplifier
     Set the SQA-2030 MONITOR switch to SOURCE and set the front amplifier input selector to the desired input program.
   - Two-channel tape
     Set the SQA-2030 MONITOR switch to TAPE.
   - Four-channel tape or other discrete program source
     Depress the DISCRETE button.
5. Play the program. When playing records, tuners, auxiliary sources, or two-channel tapes, select the desired reproduction system as follows:
   - For any SQ program, depress the SQ button.
   - For any other matrix four-channel program, depress the R-MTX button.
   - For reproducing stereo programs in two-channel sound, depress the 2 CH button. To listen to them in simulated four-channel sound, use either SQ, R-MTX or 2→4 as you prefer.
6. Adjust the MASTER VOLUME to the desired level. Adjust the four-channel tone with the front amplifier tone controls, and the back-channel tone with the SQA-2030 BACK TONE controls. Use the SQA-2030 LOUDNESS switch if you wish.

LEVEL ADJUST (TAPE) switch (on the rear panel) adjustment: This switch adjusts the TAPE input (REC/PB input) sensitivity; move the switch to either NORMAL or LOW depending on which position provides the same volume as that of the test record. If the tape sound is distorted during SQ, R-MTX or 2→4 reproduction, the tape input level is too high. In this event, set the switch at NORMAL.

To play discrete four-channel records, a special cartridge and an adaptor must be added. If you have these components, connect the outputs of the discrete four-channel adaptor to the SQA-2030 DISCRETE INPUTs.

Tape Recording

Two-channel tape recording: While reproducing phono, fm or auxiliary programs, the signal fed to the FRONT PREAMP INPUT jacks always goes directly to the 2 CH TAPE RECORDER REC OUT jacks (REC/PB output) without being decoded. Therefore, any SQ program can be recorded as an SQ tape. The LEVEL ADJUST (INPUT) switch has no effect on the recording results.

Recording Monitor

When using a three-head tape recorder, instantaneous tape/source comparison is possible through the speakers by setting the SQA-2030 MONITOR switch alternately to SOURCE (sound from source is heard) and to TAPE (sound from tape an instant after it has been recorded is heard). In this event keep the tape recorder monitor switch at TAPE.

CARE OF YOUR SQA-2030

CLEANING

Finger prints, food and beverage stains, dust and dirt, etc. can mar the beauty of your SQA-2030. The cabinet, panel and knobs can be cleaned with a polishing cloth. If this is not effective, use a soft cloth dampened with a mild soap solution. Do not use any type of scouring powder, abrasive pad, or solvent.

TROUBLE CHECKS

Should any difficulty arise with your SQA-2030, make the following simple checks to determine if the trouble is really in the SQA-2030 or external to it. Quite often hi-fi equipment fails to operate properly because of incorrect system connections. If the trouble persists after you have made these checks, consult your Sony dealer for further instructions.

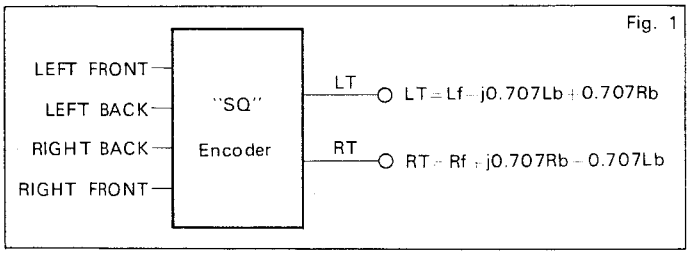
No audio from any speaker and the pilot lamp does not light.
Check power cord connection.
No audio but the pilot lamp lights.
Check the MONITOR switch setting.
Check the SYSTEM button setting.
Adjust the MASTER VOLUME control.
No audio from one channel, or unbalanced left and right volume
Check the speaker and input connections of the inoperative channel.
Adjust the front amplifier and SQA-2030 balance controls.
No audio from the back channel, or unbalanced front and back channels
Ensure that the 2 CH button is released.
Check the speaker connections.
Adjust the SQA-2030 F/B BALANCE control.
No audio from the front channel
Adjust the front amplifier volume control.
Set the front amplifier monitor switch to TAPE.
Check front speaker connections.
Adjust the SQA-2030 F/B BALANCE control.
Sound level is very low or very high.
Adjust the SQA-2030 LEVEL ADJUST (INPUT or TAPE) switch.
Lack of bass sound or obscure instrument position
Check phase-matching as described on page 9.
Reversed left and right sound
Check the speaker locations and connections.
Severe hum or noise
Use shielded connecting cables.
Keep connecting cables away from transformers or motors, and at least 10 feet from TV sets and fluorescent lights.
Reverse the ac plug in the receptacle.
Rustling sound
Make secure connections.
Wipe the plugs and jacks with a cloth lightly dampened with methanol.

TECHNICAL DATA

WHAT IS THE SQ SYSTEM ?

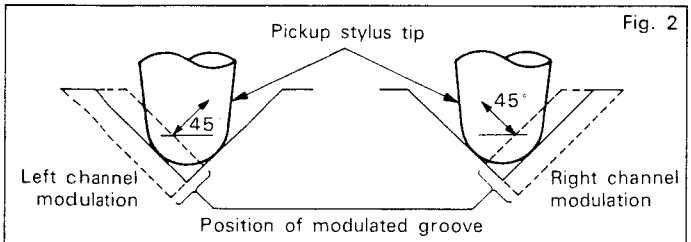
In the SQ system, a quadraphonic program is converted into a two-track program by an encoder prior to cutting the SQ record. During playback, the encoded program on the SQ record produces four-channel signals after being processed by a decoder.

Fig. 1



The SQ encoder takes the four channels of information from a four-channel master tape or from a "live" pickup, and combines them into two which have the following characteristics :
The left encoded, or "total" channel contains the left-front signal unaltered, plus reduced amounts of the two back channel signals, with phases altered.
The right "total" channel has the right front signal unaltered, plus reduced amounts of the two back channel signals, but phases shifted with relation to the back signals in the left total (Fig. 1).

Fig. 2



When the two total channels are applied to the stereo cutter, the left front and right front signals are recorded on the two side walls of the groove by cutting-stylus motion along the 45-degree lines exactly as in two-channel recording (Fig. 2).

Fig. 3

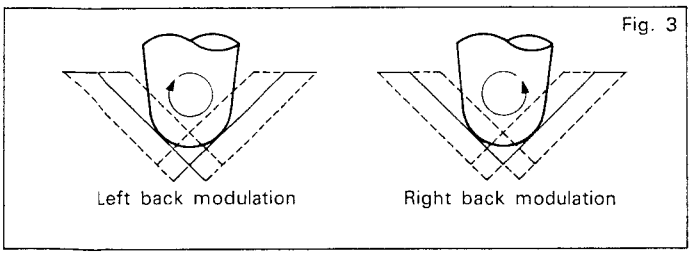
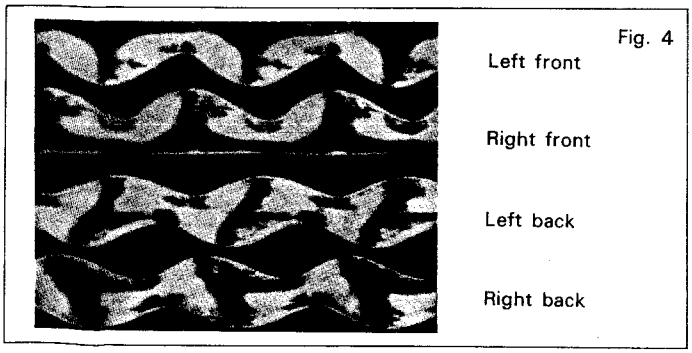


Fig. 4



Each back signal, however, (since it appears in both total channels but with a 90-degree phase difference between the two versions) produces a circular motion of the stylus, with the stylus motion for one back signal circling in the clockwise direction and the motion for the other back signal in a counterclockwise direction (Fig. 3). As the record moves under the cutting sytlus, the circular motions leave two oppositely-directed helical groove cuts (Fig. 4).

This unique stereo modulation system allows the SQ decoder to clearly sense the phases, as well as the amplitudes, of the different components of the total signal. The record is played with a standard stereo pickup, and the two total signals go to the decoder.

Fig. 5

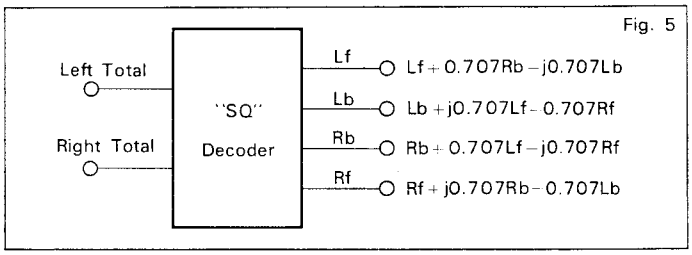


Figure 5 shows the decoder action schematically. The left total signal goes straight through to the left front speaker, the right total to the right front speaker. In addition, the decoder makes two different combinations, or matrixings, of the two total signals, to produce two more outputs, for the left back and right back speakers, respectively.

The final result of the encoding and decoding, as shown in Fig. 5, is that each speaker gets a signal in which the channel for that speaker position is dominant. Each speaker also gets "side-effect" signals, inevitable in any matrix system. The crux of good matrix design is to so dispose of the side-effect signals that they do not prevent the establishment of firm directionality.

In the SQA-2030 decoder, additional circuits are used to eliminate the "side-effect" signals so that excellent separation between all four channels is obtained. A waveform comparator circuit detects the predominant signal information by signal strength and phase-angle relationships, increases the level of this signal information, and reduces the level of the "side-effect" signal information. Therefore, excellent separation is provided between all four channels. To further improve the front-back separation, front-back logic circuitry operates to detect whether the predominant signal information comes from the front or back, and increases the level of the predominant signal information.

The results are clear in only a few moments of listening. The music is in front, to the right, in back, or wherever else the composer intended it to be, and it stays in its assigned position. The listener gets the four-channel experience to the fullest extent.

SPECIFICATIONS

Power Amplifier Section (Back channel)

Continuous RMS output power (Less than 0.8% THD)	Both channels driven simultaneously At 20 Hz – 20 kHz 18+18 watts (8Ω) At 1 kHz 22+22 watts (8Ω) · 25+25 watts (4Ω)
Dynamic output power (IHF constant power supply method)	65 watts (8Ω) 80 watts (4Ω)
Power bandwidth (IHF)	10 Hz – 25 kHz
Damping factor	Better than 70 (8Ω)
Harmonic distortion	Less than 0.8% at rated output, less than 0.2% at 1 watt
IM distortion (60 Hz : 7 kHz=4 : 1)	Less than 0.8% at rated output, less than 0.2% at 1 watt
Frequency response	20 Hz – 50 kHz $^{+0}_{-3}$ dB (DISCRETE input, 1 watt output)
Signal-to-noise ratio	90 dB (DISCRETE input, input level 250 mV, weighting network A)
Speaker outputs	Accept 4 – 16Ω speakers

Decoder and Preamplifier Section

Inputs

Measured with specified continuous RMS output into 8-ohm loads (both channels driven simultaneously) at 1 kHz.

		Sensitivity	Impedance
INPUT (from front preamp)	LOW	75 mV	75 kΩ
	NORMAL	250 mV	90 kΩ
	HIGH	500 mV	100 kΩ
2 CH TAPE	LOW	250 mV	50 kΩ
	NORMAL	750 mV	80 kΩ
REC/PB		250 mV	80 kΩ
DISCRETE		250 mV	100 kΩ

Outputs

	Level	Impedance
OUTPUT (to front preamp)	1 V (max. 5.5 V)	10 kΩ
2 CH REC OUT	250 mV	10 kΩ
REC/PB	43 mV	82 kΩ

Harmonic distortion	Less than 0.2% (input level 250 mV at 2 kHz)
Frequency response	SQ, R-MTX, 2→4 : 20 Hz – 20 kHz ±3 dB DISCRETE, 2 CH : 20 Hz – 20 kHz $^{+0}_{-3}$ dB
Signal-to-noise ratio	85 dB (FRONT PREAMP INPUT, input level 250 mV, weighting network A)

SQ separation (input signal 250 mV at 2 kHz)

Lf ⟷ Rf	20 dB	Lf ⟷ Rb	20 dB	Cf ⟷ Cb	18 dB
Lb ⟷ Rb	14 dB	Rf ⟷ Rb	20 dB		
Lf ⟷ Lb	20 dB	Rf ⟷ Lb	20 dB		

Tone controls (back channel)	BASS ±10 dB at 100 Hz · TREBLE ±10 dB at 10 kHz
Loudness control (front and back channels)	+10 dB at 50 Hz, +4 dB at 10 kHz, (Att. −30 dB)

General

Circuit system	SQ decoder with front-back and waveform comparator logic circuits, Regular matrix decoder, Direct coupled output power amplifier
Semiconductors	27 transistors, 5 ICs, 14 diodes
Power requirements	120 V ac, 60 Hz
Power consumption	70 watts
Ac outlet	One, unswitched, 300 watts maximum
Dimensions	8 7/8 (w) × 6 1/8 (h) × 12 1/8 (d) inches
Weight	15 lb 3 oz (net) · 18 lb 12 oz (in shipping carton)
Supplied accessories	Connecting cords (2)

Design and specifications subject to change without notice.

BLOCK DIAGRAM